

# CT

1

.

: CT  
(PEIT),  
: 22 CT PEIT 18 CT  
17 , 28 ( 27 , 1 )  
PEIT 38 가  
가 CT 0.9 - 5.1 cm( , 2.2 cm)  
. CT PEIT graduated grid system ,  
. 21G 22G PEIT  
, CT  
가 CT 가  
가 CT 28 - 619 ( , 261 )  
CT  
:  
( , 3.7 ), 35 - 115 ( , 85 ), 1 - 7  
mL) . CT 가 3 - 30 mL( , 12.1  
4 (14.3%), 가 4 (14.3%) . 20 (71.4%),  
가 7 (87.5%), 가 1  
(12.5%) . 가  
가 3 .  
: 가 CT PEIT  
PEIT  
CT PEIT  
CT PEIT

(percutaneous ethanol injection ther - (2, 3).  
apy, PEIT) 1983 Sugiura (1) (transarterial che -  
moembolization, TACE)  
가 3 cm  
가 3 (2 - 7). PEIT  
가 ,

CT

가

(6, 7).

PEIT가

CT PEIT

CT PEIT

CT

Somatom Plus 4 (Siemens, Erlangen, Germany)

CT 120 mL (Optiray 320, Mallinckrodt, St. Louis, U.S.A.) 3 mL/sec

30 ( ), 70 ( ), 3 ( )

1998 2 1999 12 18

30 CT PEIT

1 CT

28 , 41 PEIT

가

CT

3 38 PEIT

17 가

CT 23 가 , 5

1-90 20 CT PEIT

CT (GE 9800, Milwaukee, U.S.A.)

38 PEIT

17 가

CT CT grad-

uated grid system (8)

(Fig. 1A).

(5-7) CT

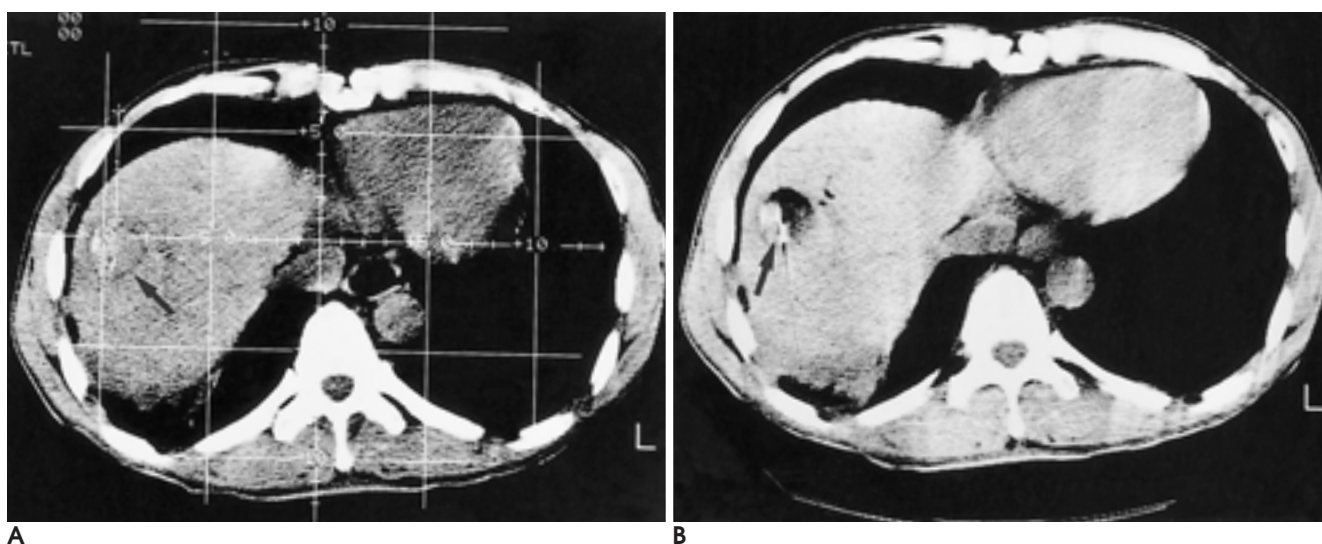
PEIT

TACE 가 가

CT

pethidine HCl (Demerol : , , ) 50 mg

2% lidocaine HCl



**Fig. 1.** Targeting process of CT-guided PEIT.

**A.** Precontrast CT scan obtained before CT-guided PEIT shows a partially lipiodolized, hypoattenuating hepatocellular carcinoma (arrow). Note graduated grid system, which was used for the decision of puncture site and direction of the needle. The tumor size and the distance between skin and tumor were also measured before placing PEIT needle.

**B.** Precontrast CT scan obtained immediately after PEIT shows an attenuation change in the same hepatocellular carcinoma which is mostly replaced by gas bubbles. This change represents liquefaction of the tumor by completely infused ethanol. Note the PEIT needle (arrow).

(Lidocaine : , , ) 10 mL

가 가 . 가

21G 22G PEIT (Hakko, Tokyo, Japan) PEIT 2 - 3 cm CT

가

가  
CT

가

. 28 12  
(Cook, Bloomington, U.S.A.)

21G Chiba

PEIT

CT

PEIT

1 PEIT

, 1

CT

99.5%

38

28

3 - 4 mL

CT

CT

CT

가 가

) ,

1 - 15

3.5

( , 264

가

(Fig. 1B).

CT

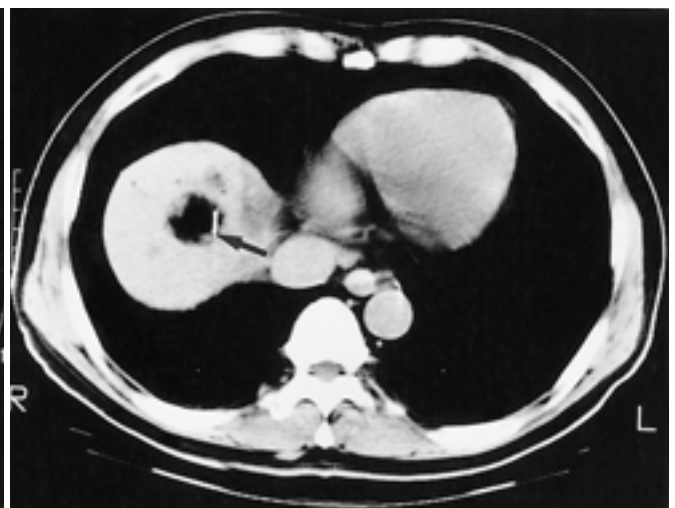
CT  
가

가

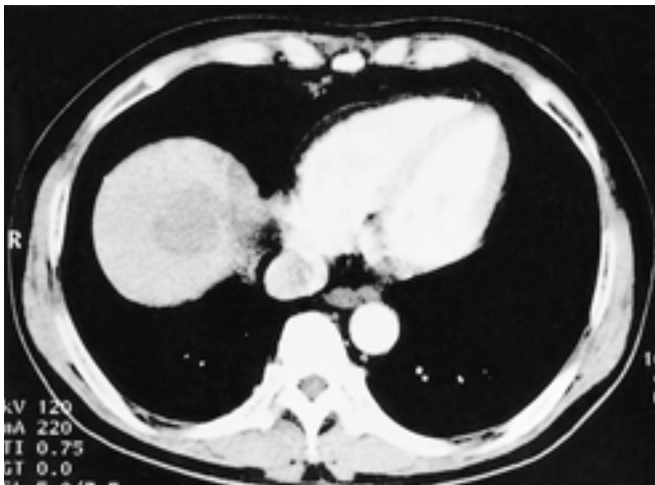
가



A



B



C

**Fig. 2.** Successful CT-guided PEIT for single hepatocellular carcinoma.

**A.** Arterial-phase helical CT scan obtained before CT-guided PEIT shows a hyperattenuating nodular hepatocellular carcinoma (arrows).

**B.** Precontrast scan obtained immediately after CT-guided PEIT shows the same hepatocellular carcinoma, which is completely replaced by gas bubbles. The PEIT needle is noted (arrow).

**C.** Arterial-phase helical CT scan obtained 2.5 months after PEIT shows a hypoattenuating area without enhancement, indicating complete necrosis of hepatocellular carcinoma.

: CT

(Fig. 2).  
가 , CT 가 가

가 . 가  
가 가 가  
CT  
CT  
가

CT

CT

CT

CT

.

CT 28 CT PEIT 38 , . 2 8 가 5 (62.5%), 가 20 , 가 8 . 2 가 가 가 1 (12.5%) (Table 1). 7 , 4 1 . 2 7 가 가 가 1 6 1

(5 )	(2 )	
	. 4	1
	가	.
가 3 cm	4	1

3.7 (1-7 ), 85 (35-115 ),  
12.1 mL (3-30 mL) . 2  
8 2.3 (2-4 ),  
26.5 mL (12-63 mL) .

CT 28 가  
가 20 (71.4%), 가  
가 4 (14.3%), 가  
가 가 4 (14.3%) PEIT  
24 (85.7%) . 가  
CT

가  
5 가 . 2  
가 3 . 2  
3.5 cm 2  
10 mL .  
가 3 CT  
가 ,  
가 .

1 2 CT CT 가  
가 TACE  
1 가

**Table 1.** Follow-up CT Results after CT-Guided PEIT

Viable Portion	No. of Treatment Session		
	Single (n = 20)	Multiple (n = 8)	Total (n = 28)
Absence	15 (75.0)	5 (62.5)	20 (71.4)
Decrease	2 (10.0)	2 (25.0)	4 (14.3)
No change or increase	3 (15.0)	1 (12.5)	4 (14.3)

Note. PEIT=percutaneous ethanol injection therapy. Numbers in parentheses are percentages.

가

1 20 15 (75.0%)

가 , 2 (10.0%) 가

, 3 (15.0%) 가 가 .

2 가

. 2 8

가 가 5 (62.5%),

가 가 2 (25.0%),

가 가 가 1 (12.5%) (Table 1).

6 1

TACE, PEIT, ,  
/  
가  
(1 - 11).  
PEIT 1983 (1)

가	(5).	가	
(3).			가
	(12).	3 cm	3
	PEIT		.
PEIT			
	(13, 14).	3 cm	
(daughter nodule)			TACE

(4, 5). PEIT가 20 1.3 가 CT  
(15), 가  
가 , 가  
, ,  
, Child C ,  
가 , (18).  
PEIT  
가 6  
CT . Ueda (8) 가  
2.3 , 14.4 PEIT가  
mL, 49.3 1 (18, 19), CT  
2 CT 1  
CT  
5 (13.5%) 가  
3.7 85 PEIT  
CT  
가 47 - 89%,  
20% 가  
가 11 - 33% ,  
(10, 20). CT  
2.6 - 4.3 ) 1  
(10, 16). Livraghi (7) 10 - 28 20 (71.4%), 가 4  
50 , 2 1 (14.3%) 24 (85.7%) ,  
1 - 8 mL 2 - 4 가 가 4 (14.3%) ,  
CT PEIT  
CT 가 8  
가 5  
CT 가 2 cm 가  
(17), 0.9 cm 가 3 CT  
2 cm 가  
PEIT 가  
가  
(2). CT 가 CT PEIT  
가 CT  
가 (liquefaction)가 CT PEIT가 가 CT  
CT MR  
(15, 17)  
PEIT , CT PEIT 가  
가

(reproducibility)

가  
가  
PEIT  
CT  
CT  
CT  
PEIT

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## The Feasibility of CT-Guided Percutaneous Ethanol Injection Therapy for Hepatic Tumors<sup>1</sup>

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**Purpose:** To describe the technical features of CT-guided percutaneous ethanol injection therapy (PEIT) for hepatic tumors that are undetectable or inaccessible under ultrasound guidance, to analyze its short-term therapeutic results, and to discuss its feasibility and limitations with a review of the related literature.

**Materials and Methods:** During a 22-month period, 17 patients with 28 hepatic tumors (27 hepatocellular carcinomas and one metastasis) underwent 38 sessions of CT-guided PEIT. Follow-up CT scanning was also performed. All tumors were undetectable or inaccessible under ultrasound guidance. The quantity of ethanol injected depended on their maximum diameter, which was 0.9 - 5.1 (mean, 2.2) cm. To determine the puncture site and direction of the needle, the graduated grid system was used. A 21 or 22-G PEIT needle was introduced into the tumor stepwise, with intermittent CT monitoring, and if the CT images obtained immediately after initial injection demonstrated incomplete perfusion, an additional dose of ethanol was administered. During the follow-up period of 28 - 619 (mean, 261) days, three-phase spiral CT scans were obtained. We focused on whether or not a viable portion of ablated tumor was present, and if so, the interval during which the extent of viable portion had changed, as well as the CT findings which suggested a predisposition to incomplete ablation.

**Results:** PEIT was successfully performed in all patients. During each session, 3 - 30 (mean, 12.1) mL of ethanol was injected for 35 - 115 (mean, 85) mins, with 1 - 7 (mean, 3.7) trials to determine the puncture site and needle direction. The follow-up CT results showed that 20 tumors (71.4%) contained no viable portion, that this portion had decreased in four (14.3%), and was unchanged or had increased in four (14.3%). In the eight tumors for which multiple sessions were required, follow-up CT showed that the viable portion was absent or had decreased in size in all except one. In five of the patients with a tumor containing a viable portion at follow-up CT, the procedure was incomplete because of unendurable pain (n = 2) or noncooperation (n = 3). A CT finding which suggested a predisposition to incomplete ablation was a poor margin (n = 3). Complications included severe pain (n = 6) and scanty peritoneal hemorrhage (n = 1).

**Conclusion:** Despite several limitations of our study, the therapeutic results of CT-guided PEIT appeared to be similar to or slightly worse than those of well-established ultrasound-guided PEIT with the former procedure, however, intermittent CT monitoring indicates whether perfusion is complete, and for this reason, CT-guided PEIT is believed to be an effective treatment modality when a hepatic tumor is undetectable or inaccessible under ultrasound guidance.

**Index words :** Liver, interventional procedures  
Liver neoplasms, therapy  
Interventional procedures, technology

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